

Biological Notes on the Cuckoo Bee Genera *Holcopasites* and *Neolarra* (Hymenoptera: Apoidea)

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Abstract A brief account of the nesting habits of *Neolarra* (*Neolarra*) *pruinosa* Ashmead is given and the resting position of the adult is described. The following details are discussed in relation to *Holcopasites* (*Trichopasites*) *insoletus* (Linsley), *H.* (*Odontopasites*) *arizonicus* (Linsley), *H.* (*Holcopasites*) *knulli* (Linsley): daily activity period of adults, host associations, nesting habits, sleeping position, and activities of larvae.

Because little has been written about the life histories of the parasitic bees of the genus *Holcopasites* and nothing about the biology of the parasitic genus *Neolarra*, the following observations, though fragmentary, are offered in an attempt to further our knowledge of nomadine anthophorids. These notes pertain to *Neolarra* (*Neolarra*) *pruinosa* Ashmead² found in the nests of *Perdita* (*Perdita*) *zebrata* Cresson³ at one-half mile northeast of Fallon, Prairie County, Montana, on August 8, 1962 and to *Holcopasites* (*Trichopasites*) *insoletus* (Linsley), *H.* (*Odontopasites*) *arizonicus* (Linsley), and *H.* (*Holcopasites*) *knulli* (Linsley).⁴ The three species of *Holcopasites* were flying on the grounds of the Southwestern Research Station near Portal, Cochise County, Arizona, during the latter part of August and during September, 1962. Their host associations are discussed below.

All specimens collected during the studies are deposited in the American Museum of Natural History. The larvae are being treated taxonomically in a separate paper pertaining to the immature stages of the nomadine complex of parasitic bees and descriptions of the nesting sites and of the biologies of the host bees will be presented in a paper on the biologies of some North American Panurginae.

The research, an outgrowth of a study of the parasitic bee genus *Oreopasites*, was supported in part by the National Science Foundation, Grant No. G-14854. The observations on *Holcopasites* were made with the assistance of Marjorie Statham Favreau; those on *Neolarra*, with the aid of my wife, Barbara L. Rozen.

Neolarra (*Neolarra*) *pruinosa* Ashmead

As is characteristic of *Oreopasites*, numerous males and females of this species flew rather swiftly close to the ground over the *Perdita* nesting site, a nearly barren earthen embankment which was at most 4 feet high. Although none was seen entering a nest of *Perdita*, an individual stopped from time to time at a

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² Adults kindly identified by Dr. Charles D. Michener.

³ Kindly identified by Prof. P. H. Timberlake.

⁴ Adults of *Holcopasites* kindly identified by Dr. Paul D. Hurd, Jr.

burrow opening and, in one instance, two were observed hovering almost stationary by an entrance where a female *Perdita* had just descended.

In the heat of the afternoon as many as three individuals of *Neolarra* clung head down on the shady side of a stem of a small, leafless plant growing on the site. Occasionally one departed and another alighted. Grasping the stem with their middle and hind legs, they tucked their forelegs behind their cheeks, directed their antennae forward, and plated their wings over the dorsa. This behavior was not sleep, for the day was clear and hot, but rather seemed to be a means of avoiding the extreme heat.

The two *Neolarra* larvae, uncovered from the cells, were postdefecating, quiescent forms with rigid integuments and without cocoons. Although one was killed for study, the other survived until the winter, a fact suggesting a single generation a year and a hibernating, postdefecating larva. The green feces were plastered over the cell wall, especially over the lower posterior end of the cell.

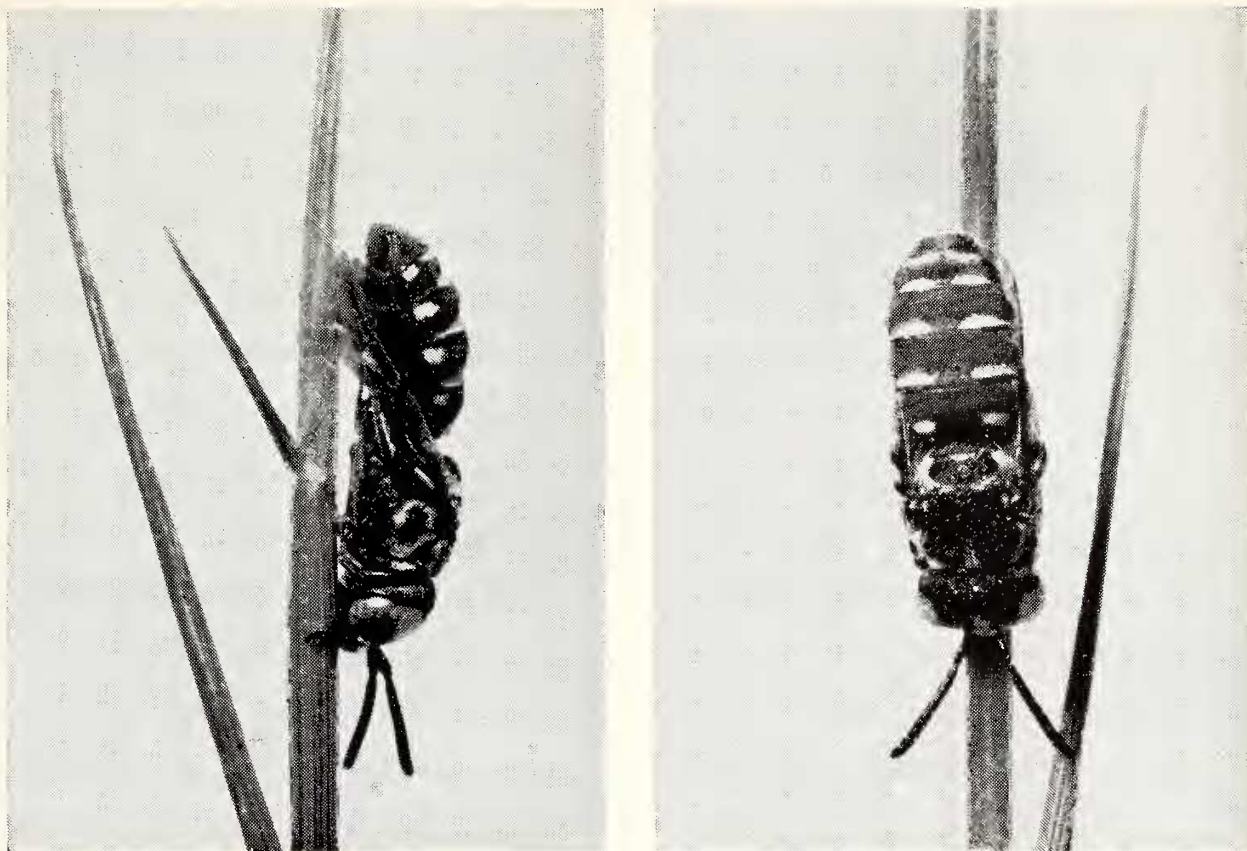
Holcopasites

Adults of *Holcopasites insoletus*, *arizonicus*, and *knulli* were abundant on the grounds of the Southwestern Research Station where *Calliopsis* (*Calliopsis*) *crypta* Shinn and *C.* (*Calliopsis*) *rozeni* Shinn, and *Pseudopanurgus* (*Pseudopanurgus*) *aethiops* (Cresson), *P.* (*Pseudopanurgus*) *timberlakei* Cockerell, *P.* (*Heterosarus*) *perlaevis* (Cockerell), and an unnamed species of *Pseudopanurgus* were known to nest.⁵ A number of other species of *Pseudopanurgus* also collected pollen from flowers on the grounds during the same season and therefore possibly nested there.

Adults of *H. knulli* were uncovered several times from nests of *C. crypta* and adults of *H. insoletus* were most abundant in areas used by several species of *Pseudopanurgus*. The fact that *H. knulli* individuals are uniform in size whereas those of *H. insoletus* vary in length further suggests that *H. insoletus* parasitizes the various-sized *Pseudopanurgus* and *H. knulli* attacks *C. crypta* and perhaps *rozeni*, which are about equal in size. The size of the adult parasitic bee is apparently determined by the quantity of the provisions which, in turn, depends upon the size of the host. As two different kinds of *Holcopasites* larvae were recovered from the cells of what was possibly *P. timberlakei* or the unnamed *Pseudopanurgus*, *H. arizonicus* might attack *Pseudopanurgus*. Linsley, MacSwain, and Smith (1956) reported the association of *H. arizonicus* on a *Pseudopanurgus* in Mexico.

Restricting their activity primarily between 9 a.m. and 1 p.m., the females of the three *Holcopasites* search for nests in a fashion similar to those of *Oreopasites*; i.e., they slowly fly over the nearly horizontal nesting site, stopping frequently on tumuli or at the edges of stones under which might be burrow entrances. No males were found during the course of the observations. At night the

⁵ *Calliopsis* identified by Mr. Alvin F. Shinn; *Pseudopanurgus*, by Prof. P. H. Timberlake.

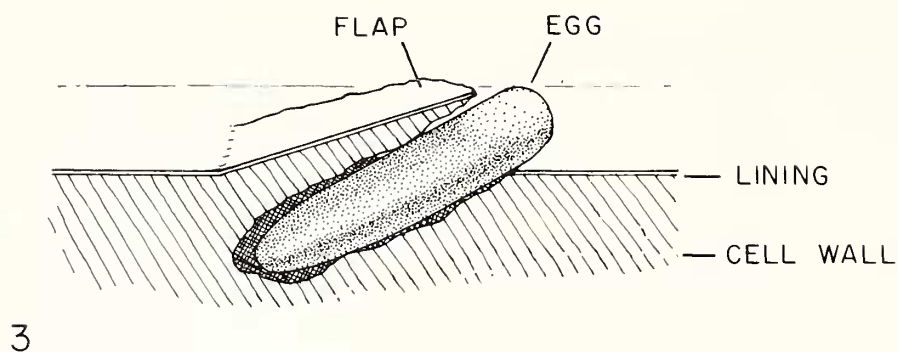


FIGS. 1, 2. Adults of *Holcopasites knulli* (Linsley) sleeping on grass stem, lateral and dorsal views.

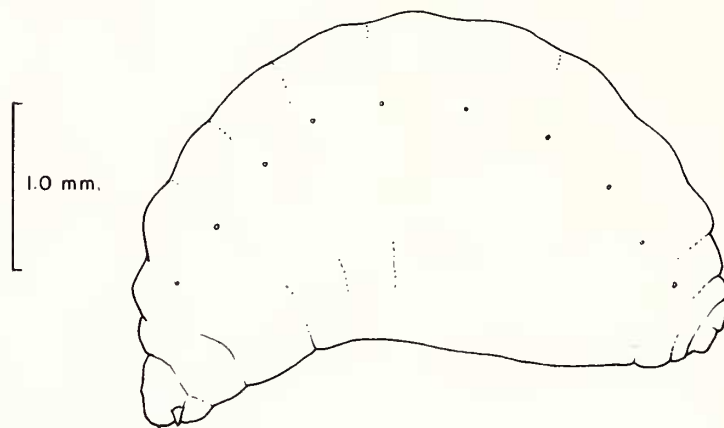
females of at least *H. insoletus* and *H. knulli* slept on grass stems in the vicinity of the nesting sites. Either in a head up or head down position, they hold onto the stems solely with their mandibles. They appress the front and middle legs to their body while they bring the wings down and back, holding them against the undersurface of the metasoma with the hind legs (Figs. 1, 2). The antennae are directed forward. While sleeping, they are not easily disturbed; the grass stem to which they cling can be picked and brought to the laboratory without the bees altering their position. Ainslie (1937) reported similar habits for *H. (Holcopasites) calliopsidis* (Linsley) (as *stevensi* Crawford).

Oviposition may take very little time. A specimen of either *H. arizonicus* or *H. knulli* descended into a burrow of *Calliopsis* and returned to the surface in 2 minutes. At the *Pseudopanurgus* nesting area three individuals, presumably of *H. insoletus*, took from 2 to 3 minutes to reemerge. Unfortunately, in no case were these cells examined for freshly deposited parasite eggs.

Because *Holcopasites* eggs have been recovered from partly provisioned *Calliopsis* cells, it seems safe to assume that the female parasite visits the cell before closure, as do the females of *Oreopasites* and other nomadine bees. The parasite eggs have been recovered from the cells of both *P. aethiops* and *C. crypta*. In all cases the egg is inserted at an angle under a U-shaped flap in the cell wall (Fig. 3). Of the total 12 eggs or egg slits found, none paralleled the



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FIG. 3. Diagram of insertion of *Holcopsisites* egg in cell wall.

FIG. 4. Live mature, predefecating larva of *Holcopsisites* taken from cell of *Pseudopanurgus perlaevis* (Cockerell).

long axis of the cell and most were in the roof or sides of the cell. The maximum number of parasite eggs found in any cell was six in a nest of *C. crypta* from which a female of *H. knulli* had been captured. This, however, seemed to be an obvious case of multiple parasitism as the nest had apparently been abandoned with the cell left open several days prior to excavation. The elongate, whitish, semitransparent egg has its anterior end rounded and the posterior end more tapering and possesses a shiny, smooth chorion. Unlike the chorion of *Calliopsis* and *Pseudopanurgus* (and for that matter other panurgines) which seems to dissolve from the sedentary larva, that of *Holcopsisites* remains behind in the slit as the larva crawls away with the aid of its bilobed tenth abdominal segment which functions as a pygopod. The newly emerged, elongate larva is about 0.5 mm in length and possesses a distinctly sclerotized head capsule and elongate mandibles. A detailed taxonomic description will be presented elsewhere. With its long mandibles it kills the egg (or eggs) of its rival sibling and the egg of the host. Whether the *Holcopsisites* larva must feed upon the host egg to develop is not known, but three of the four second instars were uncovered while consuming the eggs of *P. aethiops* and *P. perlaevis*. None was found feeding on the early instar of the host, as occasionally happens with *Oreopasites*. After the larva (at least those from *Pseudopanurgus* cells) begins to eat, it becomes extremely robust

(Fig. 4) and remains that way until defecation. The only larva (from a *Pseudopanurgus* cell) reared to the postdefecating stage began to defecate within several days after depleting the provisions. The feces, approximately the color of the provisions, were eliminated as very moist pellets and the pollen walls are not dissolved by digestive enzymes.

Two postdefecating larvae were excavated from a *Pseudopanurgus* nest. Like similar stage larvae of *Oreopasites* and *Neolarra*, they lacked cocoons and possessed a rigid integument. Both either became or were quiescent and later hibernated. The smaller of the two had not consumed the entire food supply and both had plastered feces along the cell wall.

Literature Cited

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